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ABSTRACT

This practicum was designed to develop more positive attitudes toward science and to increase students' knowledge of science by providing supplemental hands-on activities. Second grade students were surveyed at the beginning of the school year and then were retested after participating in hands-on activities from 12 learning centers. The percentage of students in the practicum who responded favorably to statements about science rose to a considerable degree in the second survey and the percentage of students not in the practicum increased slightly. The students who were involved in the practicum increased their knowledge of the major concepts and the science vocabulary in three chapters of their required textbook. References and a bibliography are included. Appendices contain the survey instrument and a description of the learning centers' activities that supplemented the second grade science program. (ML)

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LEARNING CENTERS TO SUPPLEMENT THE SECOND GRADE SCIENCE PROGRAM

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Learning Centers to Supplement the Second Grade Science Program

by

Nina W. Webb

Cluster 16

A Practicum Report Presented to the Ed. D. Program
in Early Childhood
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Education

NOVA UNIVERSITY
1986

AUG 1986

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Abstract

Learning Centers to Supplement the Second Grade Science Program. Webb, Nina W., 1986: Practicum Report, Nova University Ed. D. Program in Early Childhood.

Descripters: Education/Early Childhood Education/Learning Activities/Learning Centers (Classroom)/Learning Experience/ Elementary School Science/Science Activities/Science Education/Science Instruction

The unfavorable attitudes of elementary students toward science was the focus of this practicum. A review of the literature indicates that most elementary science is textbook based and most instruction takes place in large groups yet evidence shows that younger students especially benefit from experiential learning, also that the best method of teaching science incorporates hands-on activities. The goal of this practicum was to develop more positive attitudes toward science in second grade students as well as to increase their knowledge of science by providing hands-on activities designed to supplement the district's adopted science program.

A set of Learning Centers furnished with the materials for hands-on activities emphasizing the eight processes identified as appropriate for grades K-3 was developed and implemented. A pre and post test attitude survey was given to all second grade students.

The percentage of students in the practicum who responded favorably to statements about science rose to a considerable degree in the second survey and the percentage of students not in the practicum rose slightly. The students in the practicum increased their knowledge of the major concepts and science vocabulary in each of the three practicum areas which were supplemented by the learning centers.

CHAPTER I
INTRODUCTION

Description of Community

For many years this was a quiet agricultural community with an economy based on citrus growing supplemented by commercial fishing, cattle, and tourism. The dawn of the Space Age changed the area forever. Now there is a blend of high technology industry and agricultural pursuits in the community.

The school was built to accommodate a rapid population growth. The area still is one of transitory residents who tend to be well educated and have a high income. This elementary school, K-6, has an enrollment of over eight hundred students. The students are predominately white and possess a broad range of abilities.

The school has shared its facilities, athletic fields, and library with the community. This has fostered strong ties and feelings about the school. Many of the current students are the children of former students which is unusual in this area of short-term residents.

Author's Role and Responsibilities

The author of this practicum has taught in the mainstream of education for the last two years. Previous teaching experiences were in special education. The writer holds a master's degree in exceptional child education with specialty in emotionally disturbed (handicapped). As a teacher of self-contained classes composed of students in grade levels 1-6 or grade levels 7-9, the author had the total responsibility for children in conflict with self and with others.

The author joined the elementary school staff in the fall of 1982 as teacher for a new class (that had been started in the spring) of self-contained emotionally handicapped students, in grade levels 2-6. When the following year the class was moved to another school, the author chose to leave special education and remain at the school.

Currently one of five second grade teachers, the writer is responsible for implementing the curriculum, planning and scheduling the instruction, and evaluating the progress of the students in her class. Communication with parents as to their child's progress is also a responsibility.

Chapter II

STUDY OF THE PROBLEM

Problem Description

Students in the second grade were "turned off" to science from a lack of hands-on science activities.

The Merrill science program, Accent on Science, was the adopted science program for elementary schools in this school district. This program consisted of pupil editions, teacher's annotated editions, activity books, and evaluation spirit duplicating masters. This textbook series reflected the content emphasis as do most textbook series (Good, 1977).

It is generally agreed that science is as much a process and an activity as it is an organized body of knowledge, thus reading and discussion alone are not appropriate methods for learning science.

Studies have shown that hands-on activities are especially beneficial for younger students. Hands-on activity does not mean watching a teacher or a peer perform a demonstration.

As much priority should be given to the processes of science as a way of learning science as is given the cognitive and manipulative demands (Showalter, 1984).

The developers of Science: A Process Approach emphasized eight processes for grades K-3:

1. Observing
2. Classifying
3. Using Numbers
4. Measuring
5. Using Space-time relationships
6. Communicating
7. Predicting
8. Inferring.

In How Children Learn Science Ronald Good discusses five distinctly different teacher roles and assesses their appropriateness to four conditions. The first three conditions evolved from his study of the nature of children's thinking. The fourth is his definition of science.

> "Condition One: There are wide variations in development levels among children in most classrooms and , thus, equally wide variations in their conceptualizing abilities.
>
> Condition Two: Conceptual learning is tied closely to developmental

level and occurs primarily as a result of a child's internalizing his or her own actions on objects.

Condition Three: It appears that direct, verbal instruction has little effect in facilitating advancements of developmental levels and, thus, the ability of children to conceptualize problems beyond their current developmental abilities.

Condition Four: Science is an attempt to make sense out of one's environment by manipulating portions of that environment at a difficulty level consistent with one's conceptual abilities."

The five teacher roles or instructional strategies are:

Role A. Lecturer and Question Answerer

Role B. Discussion Leader

Role C. Activity Director and Evaluator

Role D. Activity Facilitator

Role E. Co-investigator.

Roles A and B are found to be incompatible with the four conditions. Role C is found to be partly conpatible as it requires that the children engage in "hands-on" activities. Roles D and E are found to be compatible with the four conditions. Roles D and E describe classrooms wherein "hands-on" activities are occurring and that the teacher is nondirective and accepting (Good, 1977).

The adopted science program for second grade students in this school district is not activity based thus the students were "turned off" to science.

Problem Documentation

The National Science Teachers Association surveyed 252 elementary science teachers across the United States during the 1982-83 school year. One hundred schools were randomly selected from a list available through the National Association of Elementary School Principals. Questionaires were distributed to K-6 teachers in the hundred schools and returned to NSTA. The teachers surveyed indicated that most use hands-on activities. They also indicated that most of the instruction takes place in large groups. However, large group instruction tends to be a demonstration of hands-on activities rather than student hands-on activities. Small group activities are used in less than 50 percent of the classrooms. This indicates students are not given a chance to explore ideas on their own (Teters, Gabel, and Geary, 1984).

In Ames Community Schools the hands-on approach was a district-wide program on paper only. The science coordinator ascertained through classroom visitations and personal contacts that hands-on science was in serious trouble in the science curriculum (Spratt, Kelly, and Kiser, 1983).

Also in 1982, a national assessment of science conducted by the Minnesota Science and Research Project found a decline in science process skills of today's nine-year-olds. Additionally the attitudes of nine-year-olds today is less positive toward their science classes than nine-year-olds of five years ago. Only 60 percent report being happy in science classes, only 57 percent feel successful in science, and only 53 percent are excited about science classes (Rakow, 1984).

At the school of this practicum two sets of the five second grade teachers exchanged classes for science and social studies instruction. Those teachers who teach science were asked questions from the NSTA survey.

The teachers surveyed indicated that the most commonly used methods of science instruction are reading, demonstration, and discussion. The teachers' answers to the question of what hampers their science teaching most seriously was the answer most frequently mentioned on the NSTA 1982-83 survey, lack of supplies (Teters, Gabel, and Geary, 1984). The teachers have not used a process-based national curriculum project within the last two years. They do not agree that preschool/elementary science is being adequately taught at their school today. (See Appendix A Survey of Second Grade Science Teachers at the School of the Practicum.)

Analysis of the Causes

In Piaget's theory of intelligence there are three major periods in the development of thought. Extending from birth to one-and-a-half or two years is the sensori-motor period; the years from two to eleven or twelve is the period in which concrete logical operations emerge; and from eleven or twelve into adolescence is the period of formal logical operations. There are two major stages in the second period. The first stage, from two to seven years, is the stage of preoperational thought. The second, from seven to eleven or twelve years, is the stage of concrete logical operations. The transition from preoperational thinking to concrete operations is relatively rapid. Appearing first in certain areas of experiences, logical thinking gradually extends to other areas.

In the concrete stage logic is closely tied to the content of the problem. The form of the logic cannot be independent of the specific content of a particular problem. A child at the concrete

operational stage has the ability to observe, judge, and evaluate in less egocentric terms and express more objective explanations than a child in the preoperational stage. Yet the operational stage child cannot verbally express hypotheses following a long series of connected ideas without concrete references.

Findings in an experiment conducted by Jan Smedslund (1961) illustrate Piaget's belief that the acquisition of operational systems cannot be accelerated very much through a formal program of demonstrations.

Children, ages five to seven, were given a pretest of conservation of weight which identified two groups of subjects: conservers and non-conservers. Training sessions were held for the non-conservers in which constancy of weight was demonstrated in various ways. After an interval the same test was given as a post test to all subjects. All subjects believed weight would remain constant. However in this experiment the weight was altered so it did not remain constant. All subjects from the trained group reverted to their original preoperational answers while the majority of the group of conservers felt that something was wrong.

Instruction which attempts to prove a principle with logic or scientific experiments is wasted on children in the preoperational stage. Educational activities that give the child the opportunity to observe and describe on the level of perception would be more appropriate.

Piaget points to three realms of experience that may account for cognitive growth and the beginnings of logical operations at age seven. Social experience, while the least important, provides the child with confronting views and the ideas of others. Second is physical experience which consists of activities directed to exploring the properties of objects. Piaget calls the third area of experience "logic-mathematical." The knowledge gained in this area is from actions which transfer the objects rather from the objects themselves. Activities of this sort are bringing together, taking apart, grouping, ordering, and counting.

Cognitive change requires many transactions with the physical world. Piaget has stated that children in school should be "allowed a maximum of activity of their own, directed by means of materials which permit their activities to be cognitively useful. In the area of logic-mathematical structures, children have real understanding only of that which they invent themselves, and each time that we try to teach them something too quickly, we keep them from reinventing it themselves."

Piaget believes the important aspect of the child's personal exploration of objects is the action involved, in the construction of methods and not the end product of a concept or a fact (Chittenden, 1970).

Generally second grade students are age seven or so, about the time transition from preoperational thinking to concrete operations occurs.

Hands-on activities are appropriate methods to help second grade students in both developmental stages, preoperational or concrete, learn science. Neither reading and discussion alone, nor these augmented by watching a teacher or a peer perform a demonstration are adequate methods of science instruction. The child experiences science only when allowed to ask questions of the environment and is given the freedom to use his senses to answer these questions (Anderson, DeVito, Dyrli, Kellogg, Kochendorfer, Weigand, 1970).

Appropriate science experiences should be provided for each student at every grade level. The cognitive and manipulative demands of learning science should match the developmental level of each student to assure individual student success (Showalter, 1984).

Good (1977) believes that many of the textbooks and materials developed to teach science assume levels of thinking that is not available to all of the children in a given classroom.

A textbook approach with a large group of students is reported to be among the most common methods of instruction used to teach elementary science according to a survey conducted by the National Science Teachers Association during the 1982-83 school year. Most teachers surveyed indicated that they used hands-on activities, yet less than fifty percent used small group activities. Hands-on activities in large groups tend to be a demonstration by the teacher or a peer (Teters, Gabel, and Geary, 1984).

At the school of this practicum the surveyed teachers indicated they use these methods of instruction because:

1. The Merrill series is district adopted.
2. No other science materials are supplied.
3. Given other curriculum emphasis little time is available for science planning or instruction.

An analysis of the problem pointed to these causes:

Students were "turned off" to science when the instruction was not matched to their developmental level.

Students were "turned off" to science when the method of instruction was limited to reading and discussion supplemented with demonstrations done by the teacher or a peer.

Students were "turned off" to science when the instruction took place in large groups and students were not given a chance to explore ideas on their own.

Relation of the Problem to the Literature

Students were "turned off" to science when the instruction was not matched to their developmental level.

Good found that a basic flaw in most textbooks and materials developed for science instruction is the assumption that all children in a given classroom are equally capable of understanding what is going on.

This is an erroneous assumption as wide variations in developmental levels exist among children in most classrooms. A two to three year range in developmental thinking ability is not uncommon at any grade level (Good, 1977).

Students in the second grade are about seven years old. In Piaget's stages of cognitive development the transition from preoperational thinking to concrete operations occurs at about seven years of age (Chittenden, 1970).

Bruner feels the preoperational child exhibits the characteristic of "centering." The centering child attends to some particular feature to the neglect of others. Centering also focuses attention to the beginning or end states of an object not the process of transformation.

The preoperational child is also characterized by a lack of the concept of reversibility. The child in this stage cannot grasp the idea that when the shape of an object is changed it can be brought back readily to its original state. Certain fundamental ideas that form the basis of mathematics and physics (in mathematics, conservation of quantity as when a set is separated into subsets and in the physical world, conservation of weight and mass as when the shape of an object is transformed) are beyond the understanding of the preoperational child (Bruner, 1960).

With the advent of concrete operations Piaget claims a profound reorientation in thinking. In this stage the child's thoughts are no longer tied to particular states of an object (Chittenden, 1970).

Operational thinking is internalized and reversible. Internalized means that the child can carry out trial and error mentally and is not required to do problem-solving by overt trial and error. Reversible means that the child intuitively grasps that an operation can be compensated for by an inverse operation.

The child in the stage of concrete operations is capable of understanding a great many of the basic ideas of mathematics and science, but only in the immediate present reality (Bruner, 1960).

Students were "turned off" to science when the method of instruction was limited to reading and discussion supplemented with demonstrations done by the teacher or a peer.

In most of the science series developed for children the textbooks give more emphasis to learning science as content rather than learning science as process (Good, 1977).

A common style of textbooks is to expound the facts of science. Usually these facts are oversimplified, often irrelevant, and sometimes wrong. The texts frequently contain discussion about the methods of science but rarely give the students a chance to practice these methods (Anderson et al, 1970).

Most textbook series suggest that the student's role is primarily a listener (to teacher or peer talk), a watcher (of teacher or peer demonstrations), and a reader.

The role of the teacher suggested by most textbook series is that of a combination of lecturer and question-answerer (Role A) and that of discussion leader (Role B) (Good, 1977).

The best learning requires some hands-on experience. Experiential learning is learning in which the learner is in direct touch with the realities being studied; contrasted with learning in which the learner reads, hears, talks, or writes about those references but never comes into contact with them as part of the learning process (Keeton, 1983).

Experience shows that the best method of teaching science incorporates a variety of learning-teaching activities, and that any one method used exclusively is not likely to be effective (Showalter, 1984).

Primary students in an activity-based inquiry program showed a high level of interest in science demonstrated when many of the students in the class participated in the school science fair. Additionally the students in this class were one year above grade level on the California Achievement Test (Holtz, 1983).

Elkind supports Dewey's contention that more emphasis should be placed on doing and less on talking during the elementary school years, especially in the teaching of science.

He states that science can be taught with a wide variety of readily available materials (Elkind, 1972).

Students were "turned off" to science when the instruction took place in large groups and students were not given a chance to explore ideas on their own.

Results of a survey taken in the 1982-83 school year conducted by the National Science Teachers Association found that most science instruction, no matter what the grade level, takes place in large groups (Teters, Gabel, and Geary, 1984).

During the spring of 1982 a survey conducted by the Minnesota Science and Research Project found that the attitudes of nine-year-olds today are slightly less positive toward their science classes than the attitudes of nine-year-olds five years ago (Rakow, 1984).

In Ames Community Schools the "old" science program (SAPS-II modules for grades K-3, ESS and teacher prepared kits for grades 4-6, and some teachers using the 1962 text Concepts in Science) was a district-wide program on paper only. In practice it was only accomplished in some elementary classrooms. This "hands-on" approach was in serious trouble (Spratt, Kelly, and Kiser, 1983).

The elementary classroom should be designed and equipped so that children may do laboratory work. Laboratory experiences have been shown to increase positive attitudes toward science. Evidence shows that younger students especially benefit from hands-on activities. Interest in science and manipulative skills are developed as well as cognitive knowledge (Showalter, 1984).

Chapter III

ANTICIPATED OUTCOMES AND EVALUATION INSTRUMENTS

Goals and Expectations

The general aims of this practicum were that:

Second grade students would develop a more positive attitude about science.

Second grade students would increase their knowledge of science.

Behavior Expected

The behavioral expectations of this practicum were:

On a student attitude survey 80% (15 of 18) of second grade students in the practicum will indicate a positive attitude about science by responding sometimes or always to the statements about science.

On a student attitude survey 70% (13 of 18) of second grade students in the practicum will indicate that they feel successful in science by responding sometimes or always to the statement "I do well in science."

Comparisons of pre-tests and post-tests of the Merrill chapter tests will show that 80% (15 of 18) of the second grade students in the practicum have increased in their knowledge of the major concepts and the science vocabulary of each chapter by scoring 70% or better on the post-test.

Comparison of pre-tests and post-tests of the Environment Subtest of the Stanford Achievement Test will show a difference of means at the 5 percent level of significance.

Mechanism for Recording Unexpected Events

A log was to be kept of unexpected events.

Measurement of Objectives

Second grade students were to be surveyed to determine their attitudes about science and science classes at the beginning of the school year. After the twelve learning centers were experienced by the students in the practicum, the second grade students were to be resurveyed regarding their attitudes about science and science classes. In this questionaire it was hoped that at least 80% (15 of 18) of the students in the practicum would have a positive attitude toward science and 70% (13 of 18) would indicate that they felt successful in science. The responses of the students in the practicum were to be compared with the responses of other second grade students.

A pre-test and a post-test on Chapter Six Heat and Temperature, Chapter Eight Air and

Weather, and Chapter One Animals Grow and Change were to be given to students in the practicum.

A pre-test and a post-test designed to assess pupils' understanding of basic consepts, the Environment subtest of the Stanford Achievement Test at the appropriate grade level was to be given to the students in the practicum.

Results of pre-tests and post-tests were to be compared.

Description of Plans for Analyzing Results

The student attitude survey data were to be tabulated. The data was to be reviewed to verify that 80% (15 of 18) of the students in the practicum indicated a positive attitude about science by responding sometimes or always to 90% of the statements about science and 70% (13 of 18) indicated that they felt successful in science by responding sometimes or always to the statement "I do well in science."

The survey data of all second grade students was to be compared to determine if a significant difference in attitude existed between students in the practicum and students not in the practicum. Pre-tests and post-tests of students in the practicum were to be compared to verify that students in the practicum had increased their knowledge of science.

The Merrill pre-tests and post-tests of students in the practicum were to be compared to verify that 80% (15 of 18) of students had increased their knowledge of the major concepts and the science vocabulary of each chapter by scoring 70% or better on the post-test.

The pre-tests and post-tests of the Environment Subtest of the Stanford Achievement Test of students in the practicum were to be compared to test the significance of a difference between the means. The 5% level of significance was to be used.

Chapter IV

SOLUTION STRATEGY

Discussion and Evaluation of Possible Solution

Students in the second grade were turned off to science from a lack of hands-on science activities.

A possible solution to this problem was to supplement the adopted textbook series with a set of learning centers provided with the materials for hands-on science activities. (See Appendix B Learning Centers to Supplement the Second Grade Science Program.) These hands-on activities emphasized the eight processes identified as appropriate for grades K-3.

Keeton (1983) states that the best learning results from a combination of theory and experience. The best learning requires some "hands-on" experience.

Teters, Gabel, and Geary (1984) recommended that children be given a chance to explore ideas on their own in order to increase their scientific curiosity.

Holtz (1983) teaches an inquiry program for primary students. She concludes that this activity-based program is an important factor in that six of her students won prizes for individual projects in the Broward County Science Fair and her students were one year above grade level on the California Achievement Test.

The Ames Community Schools, including eight elementary schools, have initiated a curriculum designed to use activity-based kits for each science unit. Hands-on experiences are available for every student. Student interest is positive (Spratt, Kelly, and Kiser, 1983).

Description and Justification for Solution Selected

The learning centers to supplement the second grade science program were designed to correlate with the Merrill science program for that grade level.

These learning centers which consisted of a set of hands-on activities at a learning center satisfy the requirements for Good's instructional strategy or teacher Role D: Activity Facilitator.

Facilitator in this sense is one who assists without directing or evaluating the actions of those being helped. The learning centers were nonverbal activities using concrete materials.

It may be argued that by identifying an activity the teacher is directing the child's actions. That is true only if the child has no other alternative.

When compared with the four conditions Good has identified Role D is found to be compatible with each (Good, 1977).

Eight processes have been identified as appropriate science methods for grades K-3: observing, classifying, using numbers, measuring, using space-time relationships, communicating, predicting, and inferring (Good, 1977). The learning center activities focused on those processes.

The hands-on activities at these learning centers were appropriate for second grade students in both developmental stages, preoperational or concrete. The students in this heterogeneous class were ability grouped for reading and attended the learning centers with members of their reading group. Within each group the students chose their partners for learning center time. Students were allowed to change partners.

The four learning centers in the classroom were science, math, language arts, and art.

On the first day of the week the teacher explained the activities planned at each of the learning centers.

Each set of partners was scheduled to one of the learning centers Monday though Thursday.

Charts showing this schedule were posted in the classroom.

Laminated Red Poster Board					Laminated Yellow Poster Board					Laminated Blue Poster Board				
Learning Center Time 1 (9:15-9:45)					Learning Center Time 2 (10:00-10:30)					Learning Center Time 3 (10:45-11:15)				
Partners	Mon	Tue	Wed	Thur	Partners	Mon	Tue	Wed	Thur	Partners	Mon	Tue	Wed	Thur
	1	2	3	4		1	2	3	4		1	2	3	4
	2	3	4	1		2	3	4	1		2	3	4	1
	3	4	1	2		3	4	1	2		3	4	1	2
	4	1	2	3		4	1	2	3		4	1	2	3
Yellow at Reading Table					Blue at Reading Table					Red at Reading Table				

Chapter V

RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

Results

The student attitude survey data indicates that students in the practicum became more positive in their attitudes toward science.

Table 1

Percentages of Students Who Gave Positive Responses

Statement	Webb Survey 1 18 Students	Webb Survey 2 18 Students	Difference	Others Survey 1 86 Students	Others Survey 2 84 Students	Difference
I like science class in school.	72%	83%	+11	84%	92%	+ 8
I enjoy doing science in school.	88%	77%	-11	84%	90%	+ 6
I do well in science.	88%	94%	+ 6	90%	90%	0
I like to read about science.	77%	94%	+17	84%	89%	+ 5
I like to watch the teacher do science experiments.	77%	94%	+17	90%	89%	- 1
I like to do science experiments.	72%	83%	+11	87%	92%	+ 5
I think I will be a scientist.	22%	33%	+11	56%	42%	-14

The survey data reported in Table 1 shows that 80% (15 of 18) or more of the students in the practicum responded sometimes or always to six of seven statements about science after they experienced the twelve learning centers. The survey data also affirms that after they experienced the science learning centers, 94% (17 of 18) of the students in the practicum indicated that they feel successful in science.

The percentage of students in the practicum who responded favorably to statements about science rose to a considerable degree after experiencing the learning centers. The percentage of

students not in the practicum who responded favorably to statements about science rose slightly in the second survey.

Table 2

Student Scores on Merrill Tests in Percent

Student	Chapter 6		Chapter 8		Chapter 1	
	Test	Retest	Test	Retest	Test	Retest
1	79	91	82	91	91	85
2	79	91	87	93	85	100
3	55	49	63	76	72	85
4	60	51	76	75	91	85
5	91	83	88	90	96	100
6	74	96	79	91	83	92
7	89	96	75	87	92	100
8	79	85	93	90	83	94
9	91	89	81	85	92	94
10	96	94	73	91	92	96
11	96	94	78	94	87	89
12	70	81	84	88	92	92
13	89	89	84	90	83	96
14	0	81	60	75	0	89
15	89	94	87	93	75	100
16	79	89	85	90	83	92
17	83	96	75	84	96	98
18	77	87	85	82	87	91

The Merrill retests verify that the students in the practicum increased their knowledge of the major concepts and the science vocabulary in each of the three chapters:

1. 88% (16 of 18) of the students in the practicum scored 70% or better on Chapter 6 retest.
2. 100% (18 of 18) of the students in the practicum scored 70% or better on Chapter 8 retest.
3. 100% (18 of 18) of the students in the practicum scored 70% or better on Chapter 1 retest.

A comparison of the pre-tests and the post-tests of the Stanford Achievment Test's Environmental Subtest shows a difference between the means of $.1 < p \leq .375$. This is not a significant level of difference.

Conclusions

The general aims of this practicum, that second grade students will develop a more positive

attitude about science and increase their knowledge of science by experiencing learning centers with hands-on science activities, were met.

The survey results suggest that learning centers with hands-on activities promote positive attitudes about science. These results also imply that the learning centers encourage students to feel successful in science.

Students in the practicum developed a more positive attitude about science by experiencing hands-on science activities.

The science learning centers in this practicum were designed to supplement the textbook series.

These activities focused on the major concepts of each chapter giving as much priority to the processes of science as to the content emphasis. Thus, the students in the practicum increased their knowledge of the major concepts and the science vocabulary in the three chapters.

The time of this practicum was too brief to expect a significant difference in scores on the two forms of the Standard Achievement Test's Environmental Subtest, yet some students who scored low on the pretest showed a marked increase on the post-test. Evidence shows that primary students benefit from hands-on activities (Showalter, 1984). The activities which allowed the students to experience science may have helped them to experience cognitive growth.

Recommendations

This practicum's time span was very brief, thus the broad concepts tested by the Stanford Achievement Test's Environmental Subtests did not indicate a significant difference. The writer recommends that others who might attempt a similar practicum add more activities for other chapters to the learning centers and extend the time interval.

Dissemination

Two presentations of this practicum were given for faculty and administration of the school by the writer.

A copy of the practicum report was submitted to the district elementary resource lead teacher of science/social studies for possible inclusion in a revised district elementary science curriculum. Preliminary contact has been made with a national science publication regarding an article based on this practicum report.

Learning centers will be developed to supplement all of the second grade science program. All second grade teachers at the school have expressed a desire to utilize the learning centers next year.

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Appendix A

SURVEY OF SECOND GRADE
SCIENCE TEACHERS AT THE
SCHOOL OF THE PRACTICUM

Survey of Second Grade Science Teachers at the School of the Practicum

1. What are the three most commonly used methods of instruction in your science classroom?

Teacher A

demonstration, discussion, reading

Teacher B

reading, discussion, demonstration

Teacher C

lecture, reading, student demonstration

2. Which process-based national curriculum projects have you used in the last two years of instruction?

Teacher A

none

Teacher B

none

Teacher C

none

3. Which three factors would be of most help to you in improving your science instruction?

Teacher A

more materials for the children to use, a better science series, more time to plan and obtain supplies and equipment

Teacher B

more materials, better facilities, more planning time

Teacher C

more materials, more field trips and first hand experiences, more help

4. Which areas hamper your science instruction?

Teacher A

not enough info in series, not enough materials, not enough projects

Teacher B

lack of materials, lack of facilities, lack of time

Teacher C

lack of materials, lack of time

5. What is the amount of time of science instruction that you average per week?

Teacher A

120 minutes per week

Teacher B

120 minutes per week

Teacher C

180 minutes per week

6. How much do you agree with the statement, "Preschool/elementary science is being adequately taught in my school today"?

Teacher A

It is not adequately taught.

Teacher B

I do not agree that it is adequately taught.

Teacher C

No, I don't agree.

Appendix B

LEARNING CENTERS TO SUPPLEMENT
THE SECOND GRADE SCIENCE PROGRAM

Learning Centers to Supplement
the Second Grade Science Program

SCOPE AND SEQUENCE

This curriculum is designed to correlate with the Merrill science program for second grade. It is designed to supplement Chapter Six Heat and Temperature, Chapter Eight Air and Weather, and Chapter One Animals Grow and Change. The scope includes an area of study in the physical (Heat and Temperature), earth (Air and Weather), and life (Animals Grow and Change) sciences.

Learning centers provided with the materials for a "hands-on" activity which meet the function of Role D: Activity Facilitator, will be used to develop this curriculum. The focus of the curriculum will be on the processes of observing, classifying, using numbers, measuring, using space-time relationships, communicating, predicting, and inferring.

INSTRUCTIONAL OBJECTIVES

Heat and Temperature

After observing that things placed in sunlight are warmer than things placed in the shade the student will infer that heat from the sun made things placed in sunlight warmer.

After rubbing two inflated balloons together until one pops the student will infer that rubbing them together made heat.

After comparing the feeling of one hand in hot water and one hand in cold water to both hands in warm water the student will discover that the warm water does not feel the same to both hands.

After placing and observing a thermometer put into hot water, another put into ice water and a third put into warm water the student will compare these temperatures with a control thermometer.

Air and Weather

After catching and investigating some air in his own plastic sandwich bag the student will state that air occupies space.

After observing air bubbles blown into a submerged tumbler the student will infer that "empty" items contain air.

After experimenting with an air filled plastic sandwich bag tied tightly to the mouth of a wide mouth gallon jar the student will list other things that air pressure supports.

After observing small, light objects move when the air is disturbed the student will infer that wind is moving air.

After observing fog formed in a bottle the student will infer that the air contains water vapor.

Animals Grow and Change

After setting up and observing an individual pond aquarium the student will compare the aquarium inhabitants with the aquariums of classmates.

After observing the development of mealworm beetles from mealworms the student will put pictures about the life cycle of a mealworm beetle into the correct sequence.

After observing the development of frogs from eggs the student will put pictures about the life cycle of a frog into the correct sequence.

LEARNING CENTER ACTIVITIES

Heat and Temperature

Science Learning Center One (1)

Materials:

Pairs of small things such as paper clips, bottle caps, paper cups of water, and pieces of aluminum foil

Activities:

Student places one thing from each pair in the sunlight.

Student places the other thing from each pair in the shade.

After about an hour, student feels each pair of things.

Student will record findings on Science Log Sheet Number One (1).

Science Learning Center Two (2)

Materials:

Two balloons

Activities:

Each student blows up a balloon and ties the neck of it shut.

Next two students rub one balloon against the other until one pops.

Student records findings on Science Log Sheet Number Two (2).

Science Learning Center Three (3)

Materials:

Three pans

Hot water, ice water, warm water

Activities:

Student fills one pan with hot (not too hot) water, one with ice water and one with warm water.

Student puts one hand in the hot water and the other in the cold water.

After three minutes the student puts both hands in the warm water.

Student records findings on Science Log Sheet Number Three (3).

Science Learning Center Four (4)

Materials:

Three jars for water

Four thermometers

Activities:

Student writes the temperature of each thermometer on Science Log Sheet Number Four (4).

Student fills one jar with hot water, one with ice water and one with warm water.

Student puts one thermometer in each jar. One thermometer is left out in the air.

Student records the temperature of each thermometer every five minutes on Science Log Sheet Number Four (4)

Air and Weather

Science Learning Center Five (5)

Materials:

Plastic sandwich bag

Wire twist tie

Activities:

Student holds open the mouth of the bag and swishes it through the air to fill it.

Student quickly closes the mouth of the bag and twists it to trap the air inside.

Student squeezes the trapped air.

Student sits on the bag.

Student experiments to see how many books the bag of air will hold.

Student records findings on Science Log Sheet Number Five (5).

Science Learning Center Six (6)

Materials:

Aquarium or pail

Clear plastic (plastic will not scratch or crack the aquarium) or glass tumbler

Straw

Water

Preparation:

Aquarium is at learning center and is about two-thirds full of water

Activities:

Student puts the tumbler in the aquarium so that it fills with water. Keeping the glass under water student turns it bottom side up and leans it against a corner so that the open end is tilted.

Student inserts the end of a drinking straw under the tilted tumbler and blows a bubble.

Student records findings on Science Log Sheet Number Six (6).

Science Learning Center Seven (7)

Materials:

Wide mouth gallon jar

Large strong plastic bag

String

Books

Activities:

Student fills the bag with air then ties the air-filled bag upside down to the jar so that the mouth of the bag is over the mouth of the jar.

The string should be wound around the bag and jar tightly several times and tied tightly with a bow knot.

Student presses down on the bag, leans on it and rests a book on it.

Student removes bag then reties its mouth to the jar as before except with the bag inside the jar. Student pulls the bag out.

Student records findings on Science Log Sheet Number Seven (7).

Science Learning Center Number Eight (8)

Materials:

Rice puffs

Flat sheet of stiff cardboard (about 11" x 17")

Activities:

Student lays cardboard on desk or the floor and sprinkles puffed rice around its edge.

Student lifts cardboard quickly keeping it level.

Student puts cardbaord down again and sprinkles rice puffs again.

Student slowly raises one end of the cardboard then lets go.

Student records findings on Science Log Sheet Number Eight (8).

Science Learning Center Nine (9)

Materials:

Baby bottle

Ice

Hot water

Lamp

Activities:

Student pours a small amount of hot water into the baby bottle.

Student quickly places the ice over the mouth of the bottle.

Student holds bottle in front of lighted lamp to view fog.

Student records findings on Science Log Sheet Number Nine (9).

Grow and Change

Science Learning Center Ten (10)

Materials:

Pint jars

Pond water (about four gallons)

Activities:

Student sets up an aquarium in a pint jar using pond water, water plants, and small creatures found in pond.

Student observes aquarium over a period of time.

Student records findings on Science Log Sheet Number Ten (10).

Science Learning Center Number Eleven (11)

Materials:

Mealworms

Baby food jars

Oatmeal, cornmeal, or flour

Piece of potato or apple

Cloth

String

Activities:

Student sets up a habitat for mealworms in a baby food jar.

Student observes development of mealworms into pupae and from pupae into beetles.

Student puts pictures about the life cycle of a beetle into the correct sequence on Science Log Sheet Number Eleven (11).

Science Learning Center Number Twelve (12)

Materials:

Frog eggs/embryos

Pint jars

Frog food

Activities:

Student sets up a habitat for frog eggs in pint jars.

Student observes development of the eggs into tadpoles and from tadpoles into frogs.

Student puts pictures about the life cycle of a frog into the correct sequence on Science Log Sheet Number Twelve.

MATERIALS LIST

Heat and Temperature

Pairs of small things such as paper clips, bottle caps, paper cups of water , pieces of aluminum foil

Balloons

Three pans for water

Four thermometers

Three jars
Hot water
Ice water
Warm water

Air and Weather

Plastic sandwich bags
Wire twists
Aquarium or pail
Water
Clear plastic or glass tumbler
Straws
String
Wide mouth gallon jar
Strong plastic bags
Puffed Rice
Flat sheet of stiff cardboard
Baby bottle
Ice
Hot water
Lamp

Animals Grow and Change

Pint jars
Pond water
Mealworms
Baby food jars
Oatmeal, cornmeal or flour
Chunk of potato or apple
Cloth
String
Frog eggs/embryos
Frog food

NOTES

Each child has a partner.

Every week each pair of students is scheduled a 30 minute time at the science learning center.

The student may choose not to participate in a learning center activity.

The student may not participate in any learning center activities when not up to date in assigned classwork.

Science Log Sheet Number One (1)

Name_____ Date_____

Draw the things you put in the sun and the things you put in the shade. Color the things that feel warm red. Color the things that do not feel warm blue.

Things I put in the sun: Things I put in the shade:

Science Log Sheet Number Two (2)

Name_____ Date_____

Draw what you did with your balloon. Draw what happens.

Science Log Sheet Number Three (3)

Name_____ Date_____

Color the hand that feels warm red. Color the hand that feels cold blue.

Science Log Sheet Number Four (4)

Name_____ Date_____

Write down the temperature of each thermometer every 3 or 4 minutes.

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Science Log Sheet Number Five (5)

Name_____ Date_____

Draw what happens when you sit on the bag. Draw the number of books your bag of air holds.

Science Log Sheet Number Six (6)

Name_____ Date_____

Draw what happens when you blow a bubble of air into the tumbler full of water. Where did it go? What happens to the water? Where did it go?

Science Log Sheet Number Seven (7)

Name_____ Date_____

Draw your bag of air on the jar. Show what happens when you push down on the bag.

Draw your bag of air in the jar. Show what happens when you pull up on the bag.

Science Log Sheet Number Eight (8)

Name_____ Date_____

Draw what happens to the rice puffs when you move the cardboard.

Science Log Sheet Number Nine (9)

Name_____ Date_____

Draw how you made fog in the bottle.

Science Log Sheet Number Ten (10)

Name_____ Date_____

Draw the different things you find in your aquarium. Count how many of each kind. Put the number next to the picture you drew of that thing.

Science Log Sheet Number Eleven (11)

Name_____ Date_____

Color the pictures about the life cycle of a mealworm beetle. Cut them out and paste them in order on this log sheet.

Science Log Sheet Number Twelve (12)

Name_____ Date_____

Color the pictures about the life cycle of a frog. Cut them out and paste them in order on this log sheet.